Global Cavity Database Report

C.M. Ginsburg (Fermilab)

On behalf of the database group (as part of S0 effort):

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Motivation and Methodology

- Common data sample, well defined data cuts
  - Everyone uses the same data to make plots – a common denominator in yield calculations
  - Data cuts can be easily specified, and anyone could reproduce your results
- Data entry rules for reliable and reproducible results
  - All RF tests from the last couple of years are included; may be flagged for exclusion
  - Uniform criteria for data entry: only allowed values for as many as possible items
  - Define everything which might vary or have underlying subtleties, e.g., “LABX#1" might be a final surface treatment referenced as a well-defined recipe anyone can look up
  - No private/sensitive vendor data
  - Anything referred to in a comment field must be for information only, and not data selection purposes
  - Minimize effort required for compliance
  - Provide regular updates at predetermined (by Akira) times

Database tool

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- Database is currently an Excel file, not yet a real database
  - http://tdserver1.fnal.gov/project/ILC/S0/ILC-Cavity-Database/DB_coord.html
- Sections
  - Cavity-specific: process type, cavity type, etc.
  - RF-test-specific: gradient, Q0 at max gradient, test limitation, etc.
  - Database-specific: include RF test or not and if not, why not?
- Starting point: Sebastian Aderhold's optical inspection spreadsheet
- DESY database to replace spreadsheet soon
  - Work by Dieter Gall, Vladimir Gubarev, Sibel Yasar
  - DESY agreed to provide limited support for inclusion of global data into their database
  - All the participating labs agreed to put their data into the DESY database
  - First version of the database privately available
    - DEMO
- Plots for this talk are from spreadsheet version 10/27/2009

Details of the current dataset

- 10/27/2009 Excel spreadsheet contains data from all three regions, from the last few years
  - KEK [5 cavities]: [MHI005:MHI009]
    - Requiring already-qualified vendor eliminates all
  - JLab, Cornell, Fermilab [18 cavities]: [A5: A9], [TB9ACC010:TB9ACC015], [AES001:AES004], [TB9AES005:TB9AES006], JLAB-2
    - [Reduces to 7] Requiring already-qualified vendor [-7] and standard processing [-3] and one not proc/test yet [-1]: ACCEL6, ACCEL7, [TB9ACC011:TB9ACC015]
  - DESY [53 cavities]: [AC112:AC129], [Z130:Z145], [AC146:150]

    (Production batches 5, 6, &7 are represented) and [Z88,Z93,Z97,Z98,Z100:Z104,Z106:Z110] (Production 4)
    - [Reduces to 24] Requiring EP [-13], a successful first test [-8], fine-grain [-3]: AC115, AC122, AC124, AC125, AC126, AC127, Z130, Z131, Z132, Z137, Z139, Z141, Z143, AC149, AC150

- Statistics recently (since Albuquerque) increased by 14 cavities by including DESY production 4 in the database effort

"Qualified-Vendor" Production Yield Plot - Method

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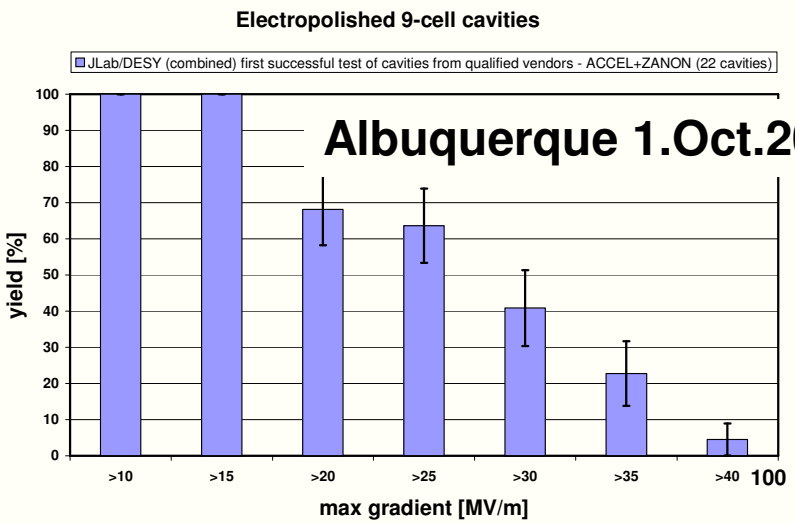
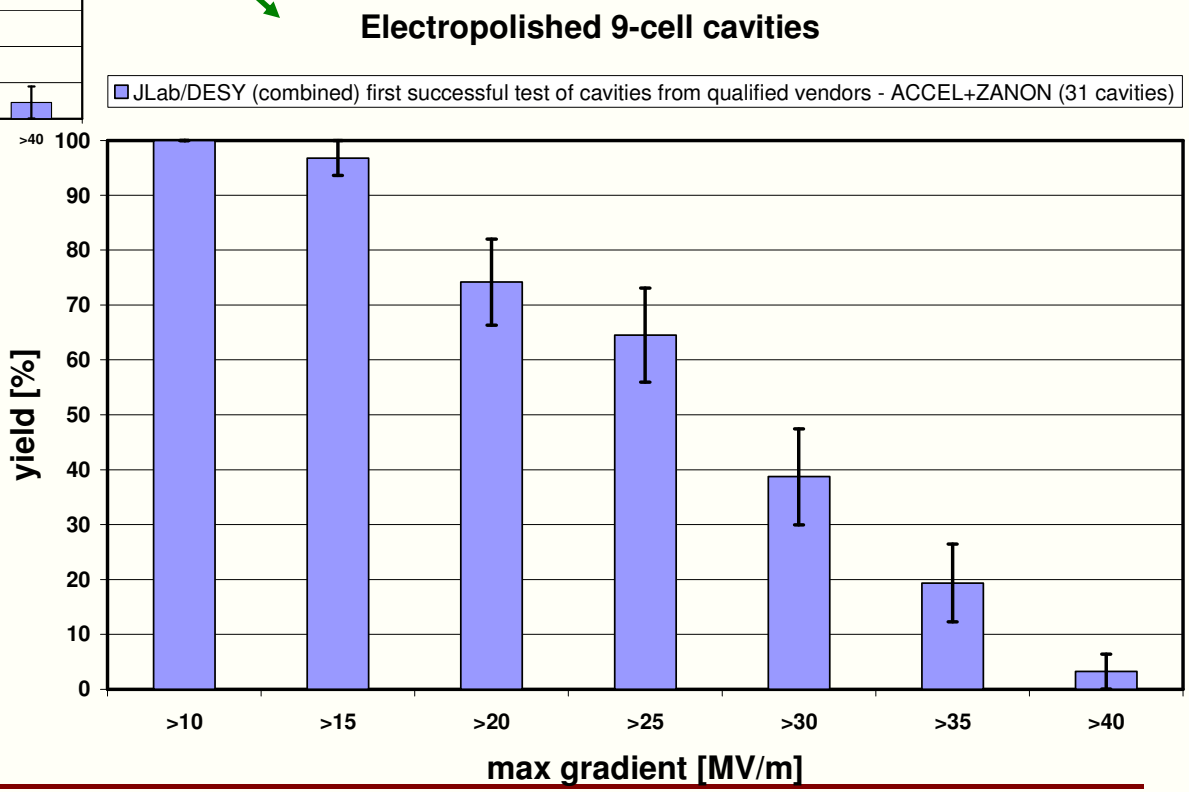
- Database version 10/27/2009
- Cuts
  - Cavity from qualified vendor= ACCEL or ZANON
  - Fine-grain cavity
  - Use the first successful (= no system problem/limitation) test
  - Standard EP processing: no BCP, no experimental processes
    - Defined as JLab#1, DESY#2 (weld tank before test), DESY #4 (weld tank after test)
  - (Ignore test limitation)
- Also known as "first-pass"
- Include binomial errors

"Qualified-Vendor" Production Yield Plot (First Pass)

Fermilab



add DESY Production 4



"Up-to-second-pass" Production Yield Plot (qual. vendor) - Method

Fermilab

- Database version 10/27/2009

- Cuts
  - Cavity from qualified vendor: ACCEL or ZANON
  - Fine-grain cavity
  - Use the first successful (= no system problem) test
  - Standard EP processing: no BCP, no experimental processes
    - Defined as JLab#1, DESY#2 (weld tank before test), DESY #4 (weld tank after test)
  - (Ignore test limitation)
  - Second pass
    - if (Eacc(1st successful test)<35 MV/m) then
      - if (2nd successful test exists) then
        - » plot 2nd test gradient
      - else
        - » plot nothing [assume 2nd test didn't happen yet]
      - endif
    - else
      - plot 1st successful test gradient
    - endif

- Include binomial errors

Up-to-second-pass yield, qualified vendors

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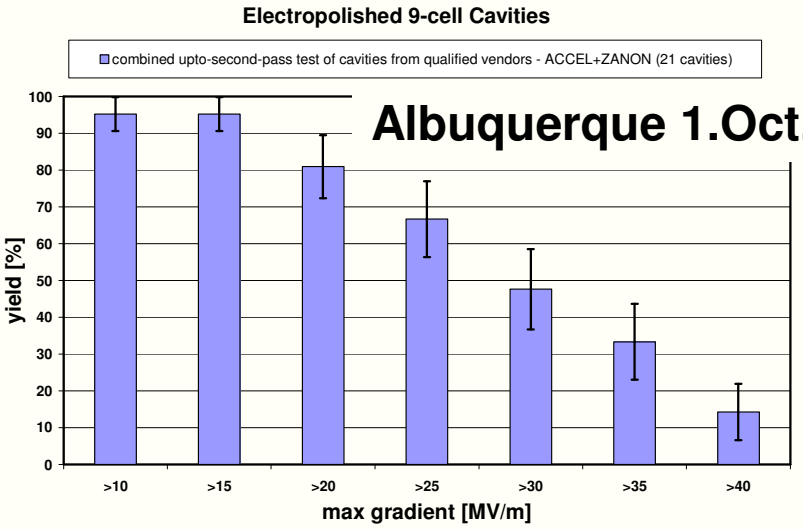
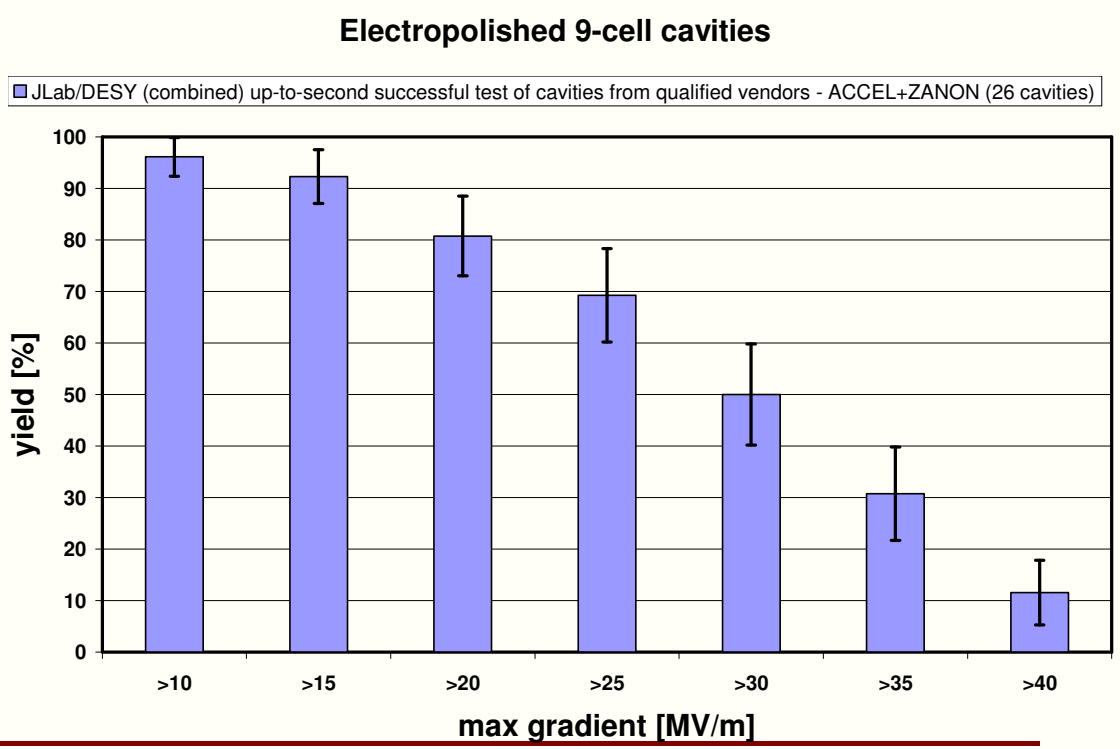


add DESY Production 4



Compare 1st and 2nd pass yields, qualified vendors

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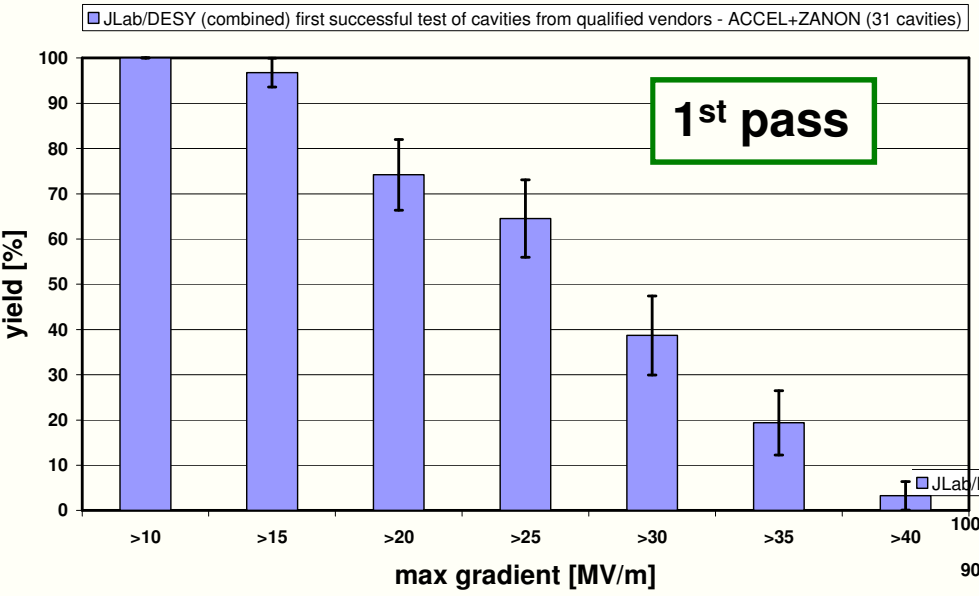
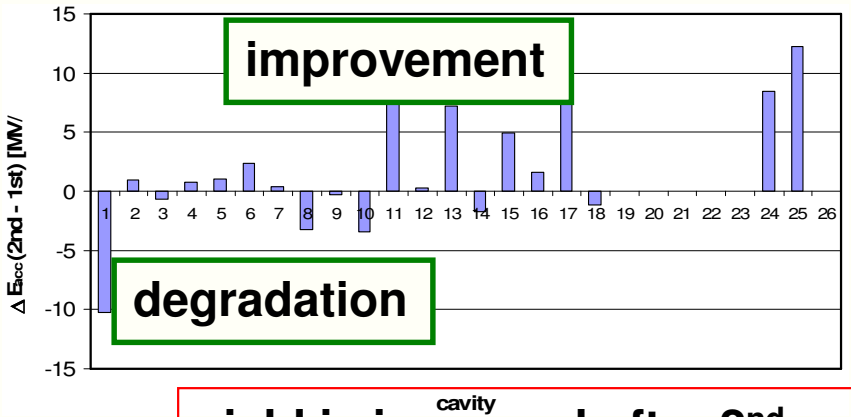
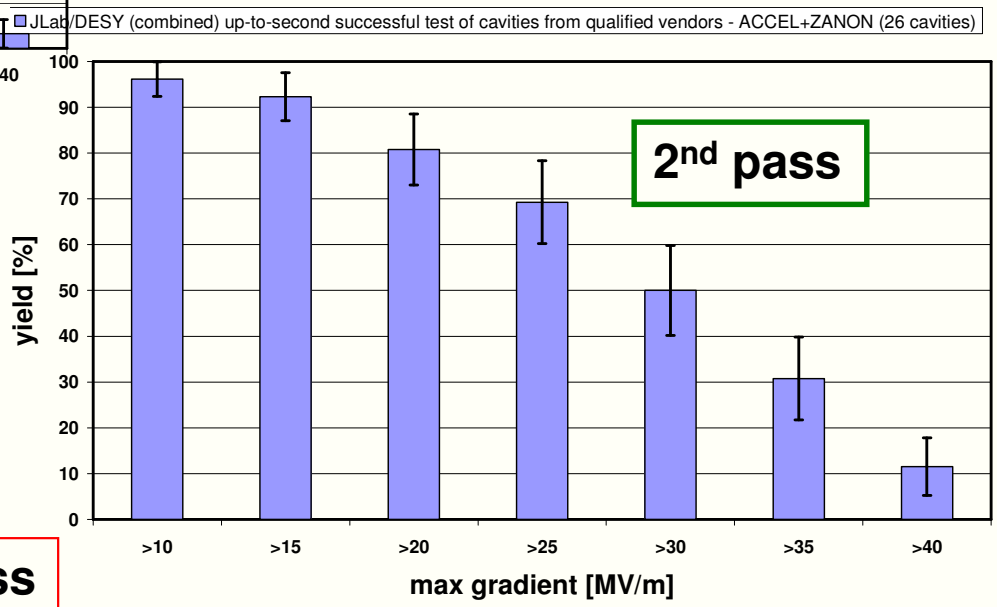
Electropolished 9-cell cavities



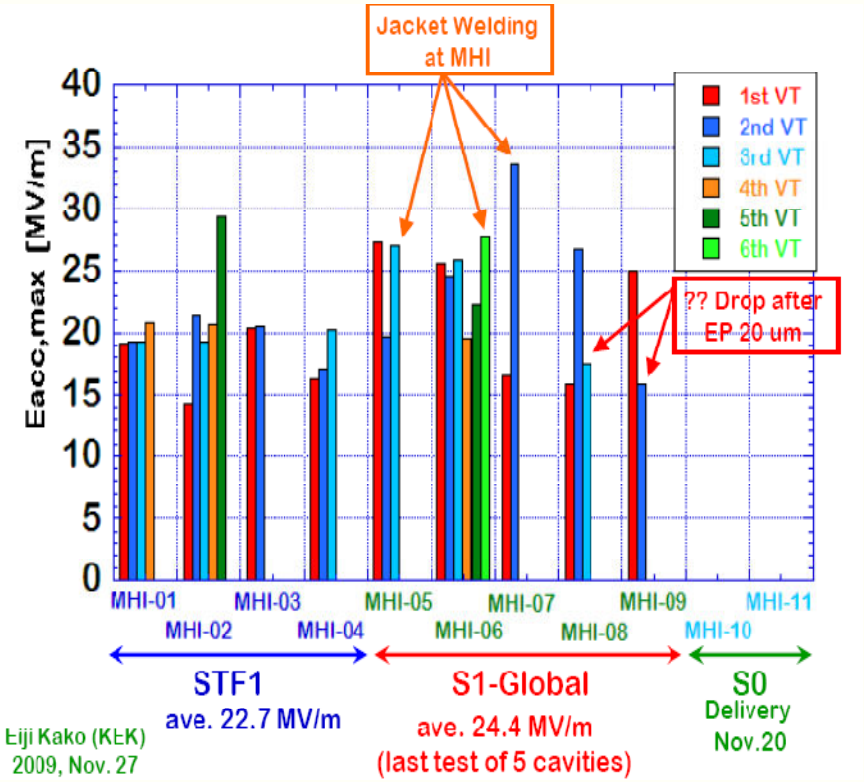


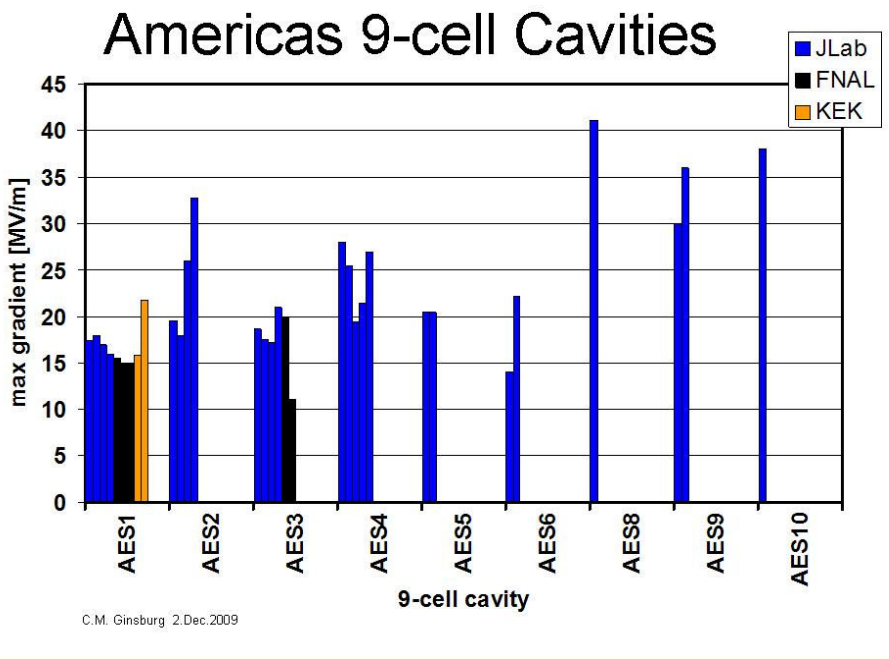
Electropolished 9-cell cavities



yield is improved after 2nd pass

New Vendors: MHI and AES





- **Performance of first cavities was poor – now improving!**
- **First four from each vendor produced differently, therefore start including starting from number 5**

New Vendor Improvement: First successful test

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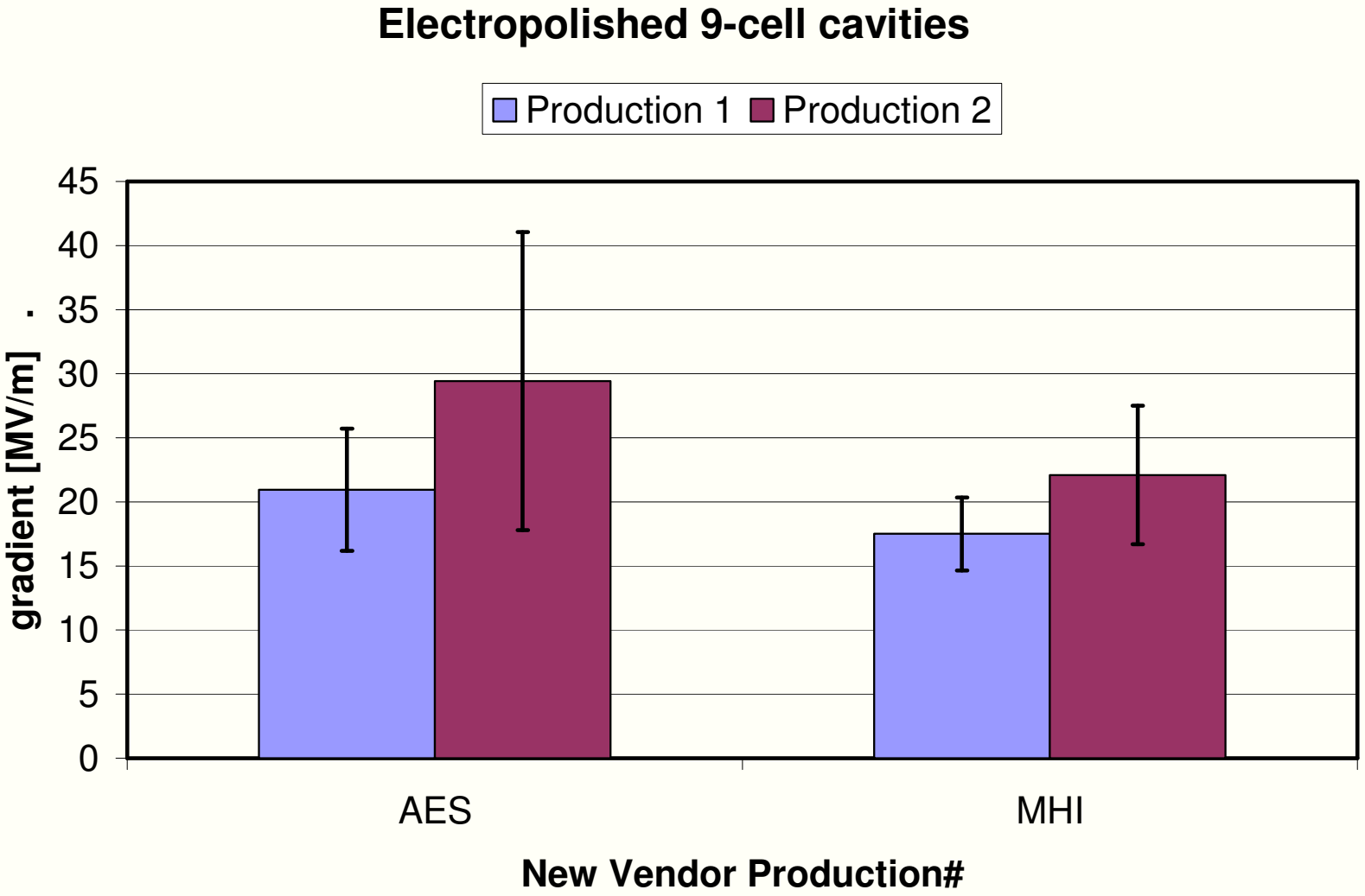

New Vendor 1st Pass Yield Plots - Method

- Not in the latest database version yet! (PRELIMINARY!)
- Cuts [same except as marked]
  - Cavity from vendor: MHI or AES, #>=5
  - Fine-grain cavity
  - Use the first successful (= no system problem/limitation) test
  - Standard EP processing: no BCP, no experimental processes
    - Defined as KEK#1 or JLAB#1
  - (Ignore test limitation)
- Include binomial errors

Compare first-pass of new/established vendors

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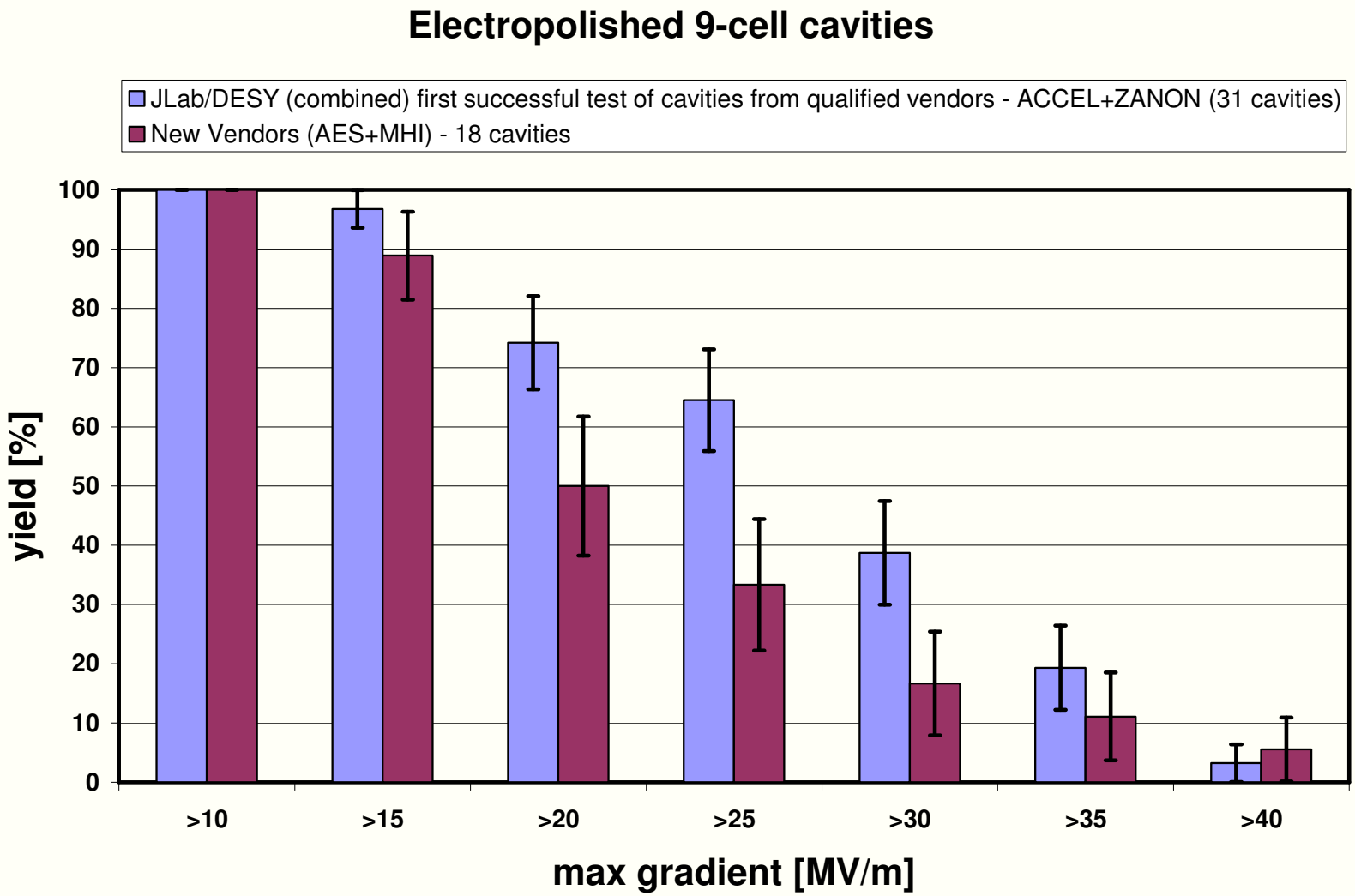

Schedule/Plan

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- ✓ FALC meeting July 13, 2009
  - Provide an example plot of production yield, citing caveats (whatever they are at the time)
    - Using preliminary and incomplete data for past 2-3 years from the simple Excel spreadsheet format, no web interface
  - Provide the people list, and the plan
- ✓ End July 2009: Determine whether DESY DB is viable option, and timescale for implementation
- ALCPG/GDE Sept. 28 - Oct. 2, 2009
  - ✓ Dataset is web-based (thanks to support by DESY)
  - Some well-checked, easily explainable, and near-final plots available for discussion such as
    - Production yield
      - ✓ Qualified vendors
      - ✓ New vendors
    - ✓ Process yield
    - ✓ Time evolution of some quantities
- End Nov. 2009: With colleagues' input, finalize DB tool, web interface, standard plots, possibly with longer-term tool improvement plans